REMARKS

Claims 1-3, 5 and 7, all the claims pending in the application, stand rejected. The Examiner has cited a new prior art reference in formulating the rejection against the amended claims.

Claim Rejections - 35 U.S.C. § 103

Claims 1-3, 5 and 7 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Kogure et al (JP 2001-35040 A) in view of Wolf et al (EP 575971A1). This rejection is traversed for at least the following reasons.

With respect to claims 1-3, the focus of the claims is a system for detecting the level of liquid in a tank comprising a float, a sensor for detecting displacement of the float and a casing arranged (1) in the tank and (2) isolated from the liquid, for accommodating the sensor. As illustrated in Fig. 1, float 12 couples to sensor 11, which is disposed in the casing 3, within a structure comprising a chamber 4 and a lid 2, the casing being disposed within the lid portion 2b. Claim 1 defines the sensor part as comprising a circuit board and a Hall IC that is mechanically and electrically coupled to the circuit board for detecting liquid level.

The rejected claims further include a recitation of a magnet (claim 2) and a non-contact coupling between the float and sensor with the Hall IC and magnet (claim 3). The Hall IC is detailed in claim 5 and it location on a circuit board specified in claim 7.

Kogure et al

With regard to claims 1-3, 5 and 7, the Examiner asserts that Kogure teaches a similar structure to that which is claimed, including a fuel gauge 11 with an arm 12, float 13 and level detector 14 having a magnet that rotates with the arm 12. The Examiner also finds first and second yokes opposite to the magnet and a Hall element between the first and second yokes, as illustrated in Figs. 2 and 3. Details of the structure of the magnet and yokes are asserted to be present in the illustrations in Figs. 4-10 of Kogure.

Applicants previously noted that Kogure does not teach an integrated Hall detector 42 (claimed as a "Hall IC"), or its position on circuit board 43. as taught in Figs. 8-10 of the present

application. Moreover, Applicants asserted that FIG. 10 shows that the sensor part of Kogure is not fluid tight, so that fuel enters the chamber of the Hall element 21 from a clearance between the shaft 12A and the slide shank 16A and magnet 17. By contrast, Applicants' sensor part is in a casing that is expressly stated to be "isolated from the liquid," where the magnet 16 is not accommodated in the sensor casing 3 at all in the present invention.

The Examiner admits that "Kogure does not specifically disclose that the casing is isolated from the liquid." Thus, the Examiner looks to Wolf et al for a teaching of a casing 22 that accommodates a Hall IC 204, 210 and is isolated from a liquid. The Examiner asserts that it would be obvious to modify Kogure et al by employing a casing isolated from a liquid, since Wolf et al teaches a contactless angular position sensor having these design characteristics and since Kogure et al states that the invention is applicable to level detectors including a sensor part attached to a pivot device/arm, a design similar to Kogure et al.

As to claims 2, 5 and 7, the Examiner finds the corresponding structure in Kogure's Fig. 10, where there is a magnet 17 that rotates in accordance with displacement of a float, and a Hall IC 21 that has yokes 18, 19 and s circuit board 20.

Finally, with respect to claim 3, the Examiner admits that Kogure et al does not specifically disclose that the Hall IC and magnet provide "a non-contact coupling which couples the float and the sensor part in a non-contact way." The Examiner looks to Wolf et al for this structure.

Wolf et al

Wolf et al is directed to a contactless angle position sensor for sensing the angular position of a pivotally mounting device (28). In an alternate embodiment that is illustrated in Figs. 16 and 17 and is referenced by the Examiner in framing the rejection, the sensor includes a magnetically sensitive device (204), such as a Hall effect IC, and a drive arm assembly 210 that carries a magnet 202 and is mounted relative to the magnetic sensing element 204 for rotation of the magnet 202 about an axis 214 (see cols. 12-13). The magnet 202 is formed as a generally circular element with a center aperture 216 and two semicircular portions 218, 220, forming

opposite poles. As explained at col. 13, line 18, the sensing element 204 is carried by a cylindrical-shaped housing 221, which is formed from a non-magnetically conductive material such as plastic, brass or aluminum. The drive arm assembly 210 includes a drive arm 235 and an annular drive portion 238 that is adapted to be coupled to a throttle shaft 26 such that the drive arm assembly 210 rotates with the throttle shaft 26 (see col. 15, line 16). The drive arm assembly may be biased to a predetermined position by a helical spring 240. Wolf et al further explains beginning at col. 14, line 33 that the sensor also includes a printed circuit board 245 that is carried by a cylindrical portion 222 of the housing 221 and provides an electrical path between the Hall effect device 204 and the external leads 246.

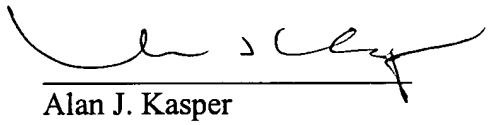
Applicants could find no teaching or suggestion that the structure of Wolf et al may be applied to the detection of a level of a liquid, particularly, a fuel level detecting device for a fuel tank. The clear focus of Wolf et al is on the detection of an angle of a throttle valve or butterfly valve. Thus, Wolf et al has no relevance to limitations in the claim related to an isolation from a liquid. Indeed, Wolf et al has no concern with liquids at all.

Kogore et al does concern a fuel tank environment. However, based on the Examiner's own admission, Kogore et al is deficient in this regard. Given the omission in Wolf et al of any concern with detecting the level of a liquid, or isolating a detector casing from a liquid, there is no basis for concluding that the invention as stated is unpatentable. Moreover, because of the different applications for the sensor structures of the two references, the two structures would not be combinable. Finally, the problem confronted by the Applicants with regard to isolating the sensor casing from the liquid, in order to provide reliable, stable and durable operation in a liquid environment, is not recognized in either reference nor is a solution to that problem even suggested by the structures and teachings of the references alone or together.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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